6 Welfare

Our measure of the welfare gains accruing to DBS consumers is a standard surplus estimate of the compensating variation. In other words, we ask how much money a consumer would need to be given to make them indifferent to losing their satellite.³³

Before presenting the results, we describe the algorithm that the estimator uses to translate observed price differences across markets into aggregate welfare numbers. To illustrate the idea, think of a world where the only multichannel video alternative to satellite is expanded basic, that expanded basic is of equal quality across all markets, that consumer preferences across markets are identical, that income effects are negligible, and that variation in price differences between satellite and cable are large enough to induce, in at least one market, no consumption of satellite.

The algorithm starts in the market with the smallest price difference between satellite and cable. It compares the satellite share in this market to the satellite share in the market that has a slightly higher price difference (between satellite and cable). For small changes in the price difference, the change in the market share of satellite is approximately equal to the share of consumers with surplus equal to the change in the price difference. Similarly, as price differences increase (as more markets are considered), the changes in share associated with incremental changes in the price difference give the fraction of consumers with this higher amount of surplus. Once demand reaches zero, the share-weighted sum of surpluses gives the average aggregate welfare gain from the existence of DBS.

In practice, we follow this approach but control for differences in demand (and valuation) that arise from variation in demographics and the quality of the available choices across markets. Thus, for the baseline we use the level of utility when satellite is available and then ask how much money it would take to achieve this utility level

³³Unlike a Paasche or Laspeyres index, this measure can accommodate the substitution effects brought about by changes in relative prices, making it well-suited to compute welfare gains due to new product introductions, since they can be viewed as a major reduction in the relative price of the new good from infinity (or at least from some very large number where demand is zero) to the actual price that exists in the market. Hicks (1946) introduces a number of different cost-of-living indexes. Hause (1975) and Mishan (1977) provide helpful discussions.

without the satellite option. We can write this compensating variation (CV) as the change in income that equates $V(\cdot)$ across the two environments considered, or

$$V_i(p, y_i; Sat) = V_i(p, y_i + CV_i; NoSat).$$
(15)

Table 9 reports the welfare gains to satellite consumers from entry of DBS. We begin by stressing the importance of using methods to control for endogeneity. We obtain estimates of welfare gains approximate three and a half times larger than corrected estimates when we assume there are no unobserved quality differences across markets (i.e., using OLS).

We estimate welfare using the IV estimates from table 7 with annualized equipment cost numbers for consumers of \$100 and \$50. The welfare results are robust to these choices, and are approximately equal to \$100 dollars per year (in excess of the price they pay for satellite). This is about \$1 billion in the aggregate. In terms of substitution, almost 95% of satellite consumers turn to some form of multichannel video (either expanded basic or premium) when they lose the satellite option. Antenna-only appears to be a poor substitute for satellite. Of those that turn to multichannel video, between 50% and 60% are estimated to turn to premium cable, with the rest going to expanded basic.

A standard criticism of the literature on calculating the welfare gains from new goods is that much of the welfare gain comes from extrapolating a functional form estimated using market prices and quantities out to regions where no data are observed (i.e., that the true choke prices are not observed).³⁴. In our final specification, we illustrate that in our setting this is not true. We have sufficient price variation and variation in market shares (after controlling for observable attributes) to yield actual market data on choke prices. We observe markets where, after controlling for attributes like the angle of dish reception and so on, the market share of DBS is very close to zero. To illustrate this, we bound the welfare calculation to be only from raising the price of satellite to the largest observed difference in price in our sample. The result for this exercise is in the final column, and we see that more than 96 percent of the total welfare gain computed in column two can be accounted for without extrapolation outside the sample.

³⁴See the discussion in Goolsbee (2002)

Table 9

The Welfare Change

Annual Compensating Variation for Satellite Purchasers

	OLS	IV	IV	IV
Mean	\$363.48	\$98.80	\$102.44	\$95.16
Std. Dev	\$129.48	\$26.52	\$28.08	
% substituting to exp basic	38.0	38.0	45.7	
% substituting to premium	57.1	57.3	49.7	_
Annualized Fixed Cost	\$100	\$100	\$50	\$100
Uses only observed price variation	NO	NO	NO	YES

Notes: Annualized fixed cost is the amount consumers perceive they pay each year towards the cost of dish and installation. Column 4 uses only price differences between satellite and cable up to the maximum observed in the data (i.e. does not increase it to infinity).

We close by considering other sources of welfare gains from new products. In the results above, we have shown that the estimated direct gains to satellite buyers from DBS are certainly positive but not enormous, once we properly estimate the demand system. We have assumed, though, that eliminating satellite would not change the incumbent price of expanded basic or of premium cable, in keeping with the findings of the U.S. General Accounting Office (2000). The standard practice in the demand literature is to take supply characteristics as given when estimating the demand system. It is perfectly plausible, however, that the introduction of home satellites could reduce (or perhaps increase) the prices of cable television for the people who do not switch to the new technology. These welfare gains or losses are part of the proper social welfare gain from new products and Petrin (2001) and Hausman and Leonard (1998) show that (at least in the cases of minivans and toilet paper) these indirect welfare gains can be quite large.

We take up the supply response of cable companies to the threat of satellite in Goolsbee and Petrin (2002). This subject is complicated by the fact that there are many potential margins of response in addition to price.

7 Conclusions

In this paper we use an extensive micro data set to examine the welfare gains from the introduction of a new form of television, the Direct Broadcast Satellite, and to estimate the demand system for cable. We add to the discrete choice literature on demand estimation, developing a framework that exploits consumer-level data and data on product characteristics and prices, uses extensive controls for unobserved product quality, and permits the distribution of unobserved tastes to follow a fully flexible multivariate normal distribution. We find a low own-price elasticity of both expanded basic and premium around -1. The satellite own-price elasticity is much higher (in absolute value), between -4 and -5, and the cross-price with respect to expanded basic is around 2 and much smaller for cable. The direct welfare gain to satellite buyers averages \$100 per year or approximately \$1 billion annually in the aggregate. While we find that without satellite most consumers would substitute to the premium cable option, many would also turn to just expanded basic. Estimates that do not control for unobserved attributes and endogenous prices yield very inelastic demand curves and welfare estimates that are several magnitudes larger than methods which correct for these problems.

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Table A1
Income Effect Parameters

Four Choices: Antenna Only, Expanded Basic, Premium, and Satellite

Variable	Coefficient	Asymp. Std. Error
Income terms:		
α_1 (\$27.5K - \$47.5K)	0.038	0.004
$lpha_2$ (\$47.5K - \$65K)	0.060	0.005
α_3 (\$65K-\$87.5K)	0.072	0.005
α_4 (\$87.5K+)	0.088	0.004
Log Likelihood	-52758	
Observations	46861	

Note: Specification is estimated using the largest 132 cable franchises in the top 69 television markets (DMAs).

Table A2

Unobserved (MVN) Taste Distribution Parameters
Four Choices: Antenna Only, Expanded Basic, Premium, and Satellite

Variable	Coefficient	Asymp. Std. Error
Multivariate Normal terms	:	·
$\sigma_{BA,PA}$	1.275	0.010
$\sigma_{BA,SA}$	2.233	0.014
$\sigma_{PA,SA}$	c 0.938	0.015
σ_{PA}^2	1.432	0.014
σ_{SA}^2	1.108	0.010
Log Likelihood	-52758	
Observations	46861	

Note: Specification is estimated using the largest 132 cable franchises in the top 69 television markets (DMAs).